

What is Claimed is:

1. A gas cap actuator system (10, 10') which actuates automatic closing and opening of a gas cap (26, 26', 26'', 74) on a fuel spout (34, 52), the system having :
 - a. a gas cap (26, , 26', 26'', 74); and
 - b. a cap actuator (16, 20, 48, 48', 72) actuated by a non-manual power source (12, 12') and which interfaces with the gas cap (26, , 26', 26'', 74) via an interface (39, 76) in a manner so as to be able to impart relative rotation between the gas cap and a fixing element (20, 78), so as to draw the cap into engagement with the fuel spout (34, 52), the interface and the gas cap being manually disengageable so as to permit manual use at the will of the operator.
2. The gas cap actuator system (10, 10') of claim 1, wherein the non-manual power source is selected from a group of non-manual power sources including electrical, pneumatic, and hydraulic power sources (12, 12').
3. The gas cap actuator system (10) of claim 1 wherein the fixing element is a driveable ring (20) having a diameter greater than the diameter of the filling tube (34) and disposed so as to slidably and rotatably fit around an end of the fuel spout (34), which the non-manual power source (12) actuates to rotate about an end of the fuel spout (34) so that when the gas cap is properly aligned with the ring, the ring draws the gas cap into sealing engagement with a rim (97) of an opening of the fuel spout (34) so as to seal the gas cap.
4. The gas cap actuator system (10') of claim 1, wherein the fixing element is a worm gear (66) having a hub (72) which engages with the cap (74) so as to be able to rotate the cap.
5. The gas cap actuator system (10, 10') of claim 1 wherein the cap (26, 26', 26'', 74) is retractably attached to a fueling door (46, 62) in a manner so as to permit manual removal of the cap from the door.
6. The gas cap actuator system (10') of claim 4, wherein a worm and worm gear arrangement (16', 66) drives the cap actuator (72) in a clockwise or counterclockwise direction.

7. The gas cap actuator system (10) of claim 3, wherein a ring (20) rotates about an end of a fuel spout (34) in a clockwise or counterclockwise direction.
8. The gas cap actuator system (10) of claim 3, wherein an external periphery of the ring (20) has teeth (38) which engage with a worm (16) driven by the motor (12), an external face of an opposite end comprising a thread (39) for interfacing with the cap (26, 26', 26''), the thread (39) making connection between the cap (26, 26', 26'') and the fuel spout (34) by turning, in order to permit automatic opening and closing of the tank
9. The gas cap actuator system (10) of claim 8, wherein a quick connection and release device (32, 32') is provided and disposed between the trap door (46) and the cap (26, 26') or cap assembly (26'').
10. The gas cap actuator system (10) of claim 8, wherein the cap (26, 26', 26'') is attached to the trap door (46) by magnetic means (32, 32').
11. The gas cap actuator system (10) of claim 8, wherein the cap (26, 26', 26'') is attached to the trap door (46) by a « VELCRO »™-type interface.
12. The gas cap actuator system (10) of claim 1, wherein the cap (26, 26', 26'') is formed to include an external gripping surface (98) having bosses (26a) that facilitate opening by hand and which further lock the cap into a guidance sleeve (24).
13. The gas cap actuator system (10) of claim 3, wherein a portion of the cap (26, 26', 26'') which penetrates into the ring (20) has a chamfer (26e) so as to facilitate the interfacing of the ring (20) in the event that the cap is not properly aligned with the ring.
14. The gas cap actuator system (10) of claim 3, wherein, when the cap (26, 26', 26'') is freed from the thread (39) and thus from the ring (20), the trap door (46), with the cap (26, 26', 26'') fixed to it, opens via a spring (90) associated with a hinge (22) and frees the fuel spout (34) to enable fueling.
15. The gas cap actuator system (10) of claim 3, wherein, when a user closes a trap door (46), the cap

(26, 26', 26'') engages on the thread (39) of the linking ring (20) which, driven by the motor (12), drives the system (10') to a locked configuration.

16. The system of claim 8, wherein the motor (12) drives the worm (16) which drivably interfaces with and is held in operational relationship to the ring (20) by a frame (42).
17. The system of claim 8, wherein rotation of the thread (39) on the ring (20) permits the opening and closing of the system (10) by disengaging and engaging the ring (20) from and with the cap (26, 26', 26'') without having to physically turn the cap.
18. The system of claim 8, wherein the ring (20) is interposed between the cap (26, 26', 26'') and a coil spring (30), which biases the ring into contact with the cap (26, 26', 26'') and permits the ring to axially move along the fuel spout (34) between stops (35, 37) which define the limits of motion of the cap.
19. The system of claim 3, wherein a low friction o-ring seal (36) protects the fuel spout (34) from an upper part of the linking ring (20) as well as helps to seal the system (10).
20. The system of claim 3, wherein a frame (42) protects the system (10) from the introduction of debris and creates a reservoir to retain lubricant to insure the smooth operation and long life of the system.
21. The system of claim 3, wherein an alignment device (50, 50') having the purpose of compensating for any misalignment of a floating guidance sleeve (24) and the cap (26, 26', 26''), comprises the guidance sleeve (24), a spring (49) and a receiver (25) mounted on a trap door (46), the guidance sleeve being able to move axially and non-rotationally relative to the fuel spout (34) by virtue of being keyed to the receiver (25) fixed to the trap door (46), and biased by the spring (49) toward the cap (26'), thus permitting the guidance sleeve (24) to be biased into engagement with the cap such that closing the trap door (46) is permitted even when alignment would otherwise prevent closing and such that, engagement of the guidance sleeve (24) is made with the cap (26, 26', 26'') is accomplished after an initial rotation of the cap with respect thereto.
22. The system of claim 21, wherein the guidance sleeve (24) is a component of a cap assembly (26'').